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AUTOMATIC BEVERAGE VENDING MACHINE

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[There are no amendments to this patent.]

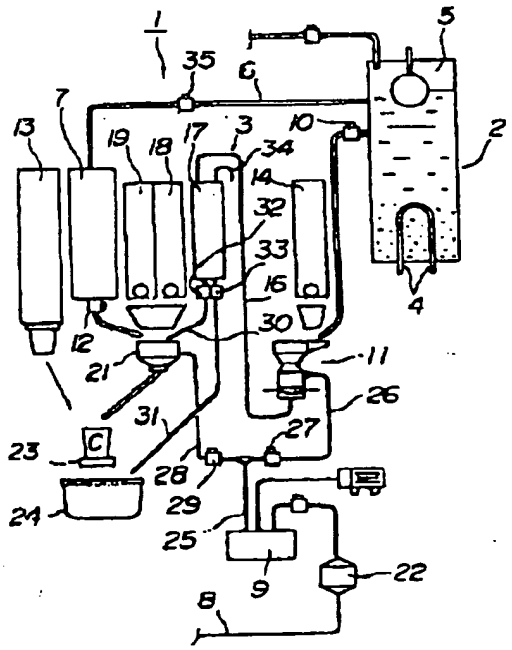
Abstract

Purpose

The purpose of this invention is to provide a type of automatic beverage vending machine characterized by the fact that it can store a beverage extracted from raw materials while inhibiting deterioration, and can provide a high-quality commodity for sale consistently and with high efficiency.

Constitution

The dispenser has a beverage storage device, wherein a highly concentrated beverage is extracted from a beverage raw material with hot water and said highly concentrated beverage is sent to a tank for storage; the tank of said device is provided with a vending means that operates to sell the beverage and/or a disposal means that operates to dispose of the beverage; there is also a hot water tank for storing hot water to dilute said highly concentrated beverage; the highly concentrated beverage stored in said [storage] tank and the hot water stored in said hot water tank are dispensed in prescribed amounts, mixed, and sold.



Claims

1. A type of automatic beverage vending machine characterized by the following facts: it has a beverage storage device, wherein a highly concentrated beverage is extracted from a beverage raw material with hot water and said highly concentrated beverage is sent to a tank for storage; the tank of said device is provided with a vending means that operates to sell the

beverage and/or a disposal means that operates to dispose of the beverage; there is also a hot water tank for storing hot water to dilute said highly concentrated beverage; the highly concentrated beverage stored in said tank and the hot water stored in said hot water tank are dispensed in prescribed amounts, mixed, and sold.

2. The automatic beverage vending machine described in Claim 1 characterized by the fact that it has a sensor for detecting the amount of the highly concentrated beverage in said tank.

3. The automatic beverage vending machine described in Claim 2 characterized by the fact that a highly concentrated beverage with a concentration 3 times or less that of the conventional concentration is supplied to and stored in said tank.

4. The automatic beverage vending machine described in any of Claims 1-3, characterized by the fact that it has plural said beverage storage devices.

Detailed explanation of the invention

[0001]

Technical field of the invention

This invention pertains to a type of automatic vending machine for coffee or other beverages.

[0002]

Prior art

The extractor described in Japanese Kokai Patent Application No. Hei 4[1992]-354912 is one example of an automatic vending machine of this type. It has a constitution in which coffee or another beverage is extracted from coffee beans or another raw material, after which the extract is mixed with cane sugar, milk, etc., and the mixture is poured into a cup for sale. The regulations of the Food Hygiene Code have made it impossible to store a prescribed amount of extracted beverage for sale in an automatic vending machine. Consequently, in the conventional system, coffee is extracted for sale one cup at a time.

[0003]

In the aforementioned system, fresh coffee is extracted for each sale, and this is an advantage. However, because a long time is required for extraction, the customer has to wait for a relatively long time (40 sec/cup) from selection of the commodity to completion of the sale. Also, the amounts of paper filters and other consumables needed for extraction become large, and it is impossible to make sales with high efficiency. This is undesirable.

[0004]

Due to an amendment of the aforementioned Food Hygiene Code, it has become possible to extract a prescribed amount of beverage for storage in an automatic vending machine of this type and to dispense the beverage into a cup in case of a sale. In the device proposed in Japanese Patent Application No. Hei 6[1994]-244265, a prescribed amount of coffee is extracted beforehand and is stored in a beverage tank while kept warm, and it is dispensed to fill up a cup each time that a sale takes place.

[0005]

However, it is well known that when extracted coffee is stored warm, various changes take place, and the quality deteriorates. Consequently, Japanese Kokai Patent Application No. Sho 62[1987]-44137 proposed a method for preventing deterioration by adding an alkali metal L-ascorbate to the extracting solvent or the extracted coffee. However, addition of artificial substances to the beverage is undesirable. Also, Japanese Kokai Utility Model Application No. Hei 6[1994]-2491 proposed a method in which a concentrated beverage is extracted and stored while kept cool, and it is re-heated and diluted before drinking. However, when cooling and re-heating are performed repeatedly, the losses in energy and time are significant, so that this is not an effective method. In order to overcome these problems, it has been proposed that the entire tank of the storage device be heated using a hot water bath. However, this method has the disadvantage of high cost and a complicated structure. If a poor quality beverage is sold, there would be significant harm to the customers, and the reputation of the sales company would suffer. Consequently, there is a high demand for improvements to automatic beverage vending machines.

[0006]

Problems to be solved by the invention

The purpose of this invention is to provide a type of automatic beverage vending machine characterized by the fact that even when coffee is pre-extracted from the raw material and is stored for supply, deterioration can still be inhibited (inhibition of an increase in sour taste, etc.), and a high-quality commodity can always be supplied with high efficiency.

[0007]

Means to solve the problems

The present inventors have performed extensive research in order to solve the aforementioned problems. As a result of this research, it has been found that a highly concentrated beverage extracted from the raw material deteriorates very little. If it is stored in

this highly concentrated form, it is possible to inhibit deterioration in quality, and then the highly concentrated beverage can be diluted with hot water when a sale takes place. The aforementioned purpose can be achieved in this way. This invention was realized as a result.

[0008]

The invention described in Claim 1 of this patent application provides a type of automatic beverage vending machine characterized by the following facts: it has a beverage storage device wherein a highly concentrated beverage is extracted from beverage raw material with hot water, and said highly concentrated beverage is sent to a tank for storage; the tank of said device is provided with a vending means that operates to sell the beverage and/or a disposal means that operates to dispose of the beverage; there is also a hot water tank for storing hot water to dilute said highly concentrated beverage; the highly concentrated beverage stored in said tank and the hot water stored in said hot water tank are dispensed in prescribed amounts, mixed, and sold

[0009]

The invention described in Claim 2 of this invention is an automatic beverage vending machine such as is described in Claim 1, characterized by the fact that it has a sensor to detect the amount of the highly concentrated beverage in said tank.

[0010]

The invention described in Claim 3 is an automatic beverage vending machine such as is described in Claim 2, characterized by the fact that a highly concentrated beverage with a concentration 3 times or less that of the conventional concentration is supplied and stored in said tank.

[0011]

The invention described in Claim 4 is an automatic beverage vending machine such as is described in any of Claims 1-3, characterized by the fact that it has plural said beverage storage devices.

[0012]

When coffee or another beverage is kept at a high temperature (80°C or higher), deterioration in quality takes place quickly, and the agreeable taste is gone in about 30 min. On the other hand, the temperature of the coffee should usually be 80°C or higher when coffee is poured into a cup, in order for an excellent coffee taste to be enjoyed. This invention is designed to resolve this contradiction. That is, the coffee extracted from the raw material has a

concentration that is 2, 3 or more times the concentration when the coffee is drunk. While the highly concentrated beverage is being stored (such as at a storage temperature of 63-80°C), the deterioration in quality can be minimized. Then, when a sale takes place, the highly concentrated beverage is diluted with hot water at 95°C or higher. That is, the beverage with a 2x concentration is diluted two times, and the beverage with a 3x concentration is diluted three times. As a result, the automatic vending machine can provide flavorful coffee at 80°C or higher. There is no special limitation on the concentration of the highly concentrated beverage, and it can be selected to be appropriate to the type of beverage. Usually, the concentration of the highly concentrated beverage is 3 times or less that of the normal concentration.

[0013]

In the automatic beverage vending machine of this invention described in Claim 1 of this patent application, a highly concentrated beverage is extracted from the beverage raw material with hot water, and the highly concentrated beverage is sent to and stored in a tank. The highly concentrated beverage and hot water stored in a hot water tank are then dispensed and mixed in prescribed amounts upon a sale instruction, and a cup of flavorful coffee is sold to the customer. In this case, the time required to complete the sale is shorter, and consumables can be used with more efficiency. Because the beverage is extracted at a high concentration from the beverage raw material with hot water, and the highly concentrated beverage is stored in the aforementioned tank, the taste and aroma and other quality characteristics can be maintained with little deterioration.

[0014]

In the automatic beverage vending machine described in Claim 2, when the amount of the highly concentrated beverage in the aforementioned tank becomes low or zero, a signal from a sensor is sent to a controller, and the controller sends a signal to again extract highly concentrated beverage from the beverage raw material with hot water, and the extracted highly concentrated beverage is sent to and stored in said tank. The aforementioned operation is carried out repeatedly to meet sales demand.

[0015]

In the automatic beverage vending machine described in Claim 4, coffee extracted from different types of raw materials can be sold in a single automatic vending machine.

[0016]

Embodiment of the invention

The automatic vending machine of this invention will be explained in more detail in the following with reference to appended figures. This automatic vending machine provides a cup of coffee to the customer, with the coffee being prepared inside the automatic vending machine. Figure 1 is a diagram illustrating the structure of the coffee preparation unit. As shown in this figure, said preparation unit (1) is mainly composed of hot water supply unit (2) and extraction/sales unit (3).

[0017]

Hot water supply unit (2) comprises hot water tank (5), which has heater (4) for heating tap water and which then stores the heated water, and hot water tank (7) that stores the hot water received from hot water tank (5) via pipe (6). Tap water is also supplied by water feed pipe (8) to steam generator (9) to be explained later. The water fed to hot water tank (5) is heated by heater (4) to a temperature of 90°C or higher for storage. The hot water in said hot water tank (5) at 90°C or higher is sent through pipe (6) and stored in hot water tank (7). (35) represents a hot water valve. The hot water stored in hot water tank (5) passes through hot water valve (10) and is fed to extraction device (11), to be explained later. The hot water stored in hot water tank (7) is fed through hot water valve (12) into mixing bowl (21). It is preferred for a heater, thermal insulating material, or the like to also be provided to hot water tank (7) in order to store hot water.

[0018]

Extraction/sales unit (3) has the following parts: cup supply device (13) that supplies cups C, coffee canister (14) for storing powdery coffee raw material (beverage raw material), extraction device (11) that mixes the powdery raw material with hot water to extract coffee, batch tank (highly concentrated beverage storage tank) (17) that stores the highly concentrated coffee at a high temperature extracted by said extraction device (11) and supplied via pipe (16), cream canister (18) for storing cream, cane sugar canister (19) for storing cane sugar, mixing bowl (21) where upon a sales command cane sugar and cream supplied from said cane sugar canister (19) and cream canister (19) are mixed with said extracted highly concentrated coffee and hot water from hot water tank (7), steam generator (9) that vaporizes water fed via filter (22) from water feed pipe (8) and sends the generated steam to extraction device (11) and mixing bowl (21), cup table (23) where cup C is placed, and waste bucket (24) arranged below said cup table. Additionally, filter (22) removes compounds of magnesium, calcium, etc. contained in water entering from water feed pipe (8) in order to purify the water. It acts to prevent adhesion of

IS THIS EXTRACTION
BROWN COFFEE MIXED W/ HOT H_2O

magnesium, calcium, and other compounds to the heat regenerator, not shown in the figure, in extraction device (11).

[0019]

Steam pipe (25) for carrying steam is connected to steam generator (9). It branches into two pipes. One steam pipe (26) runs through extraction valve (27) to extraction device (11), and the other steam pipe (28) runs through mixing valve (29) to mixing bowl (21). Also, vending pipe (30) and disposing pipe (31) are connected to the lower side of batch tank (17). Said vending pipe (30) runs through vending valve (32), and its tip is over mixing bowl (21). On the other hand, disposal pipe (31) runs through disposal valve (33), and its tip is over waste bucket (24).

[0020]

In said extraction/sales unit (3), several cups of highly concentrated coffee, extracted beforehand with extraction device (11), is fed through beverage feed pipe (16) to batch tank (17) for storage in a warm state (at 63-80°C, for example). When the commodity selection switch (not shown in the figure) is pushed for the coffee, cup feeding device (13) feeds cup C onto cup table (23). At the same time, highly concentrated coffee in an amount to make one cup is fed from batch tank (17), while cane sugar is fed from cane sugar canister (19) and cream is fed from cream canister (18), respectively, into mixing bowl (21). A prescribed amount of hot water is then fed from hot water tank (7), and these components are mixed in mixing bowl (21). The liquid mixture is then dispensed into cup C.

[0021]

Here, batch tank (17) is a storing tank for the highly concentrated coffee, and overflow tube (34) is connected to the upper portion of said batch tank (17). Although not shown in the figure, the tip of overflow tube (34) is arranged above waste bucket (24). The beverage that overflows from said batch tank (17) is guided through said tube (34) to waste bucket (24). Also, said overflow tube (34) also acts as an air inlet when coffee flows down from batch tank (17) when vending valve (32) is opened or disposal valve (33) is opened. As a result, coffee can flow more quickly from batch tank (17).

[0022]

A heater (heating means) not shown in the figure is wrapped around batch tank (17), and it is controlled to maintain a prescribed temperature (such as 63-80°C) for the highly concentrated coffee stored in batch tank (17).

[0023]

In the automatic vending machine with the aforementioned constitution, hot water valve (10) and coffee canister (14) start operation almost simultaneously before the start of sales. A prescribed amount of hot water is fed through hot water valve (10), and a prescribed amount of powdery raw material is fed from coffee canister (14), to extraction device (11). As a result, 3 cups of highly concentrated coffee is extracted with extraction device (11). By means of a pump (not shown in the figure) in said extraction device (11), the extracted highly concentrated coffee is sent through pipe (16) to batch tank (17), and is stored there.

[0024]

Then, activation of a vending button, not shown in the figure, turns power ON for an electromagnetic coil, not shown in the figure, in vending valve (32), so that vending valve (32) is opened. As a result, the highly concentrated coffee passes through vending pipe (30) to mixing bowl (21). On the other hand, hot water valve (12) is opened to supply only a prescribed amount of the hot water stored in hot water tank (7) to mixing bowl (21). Also, as needed, a prescribed amount of cane sugar is fed from cane sugar canister (19) and a prescribed amount of cream is fed from cream canister (18) into said mixing bowl (21). After they are mixed, the mixture is dispensed into cup C. In this case, depending on the preference of the customer, the amount supplied from batch tank (17) to mixing bowl (21) can vary. Also, the amount of hot water fed from hot water tank (7) naturally depends on customer preference. Consequently, it is necessary to detect the amount of the highly concentrated coffee in batch tank (17), and, if it is insufficient, to freshly extract a new batch and feed it to said batch tank (17). There is no special limitation on the means for detecting the amount of highly concentrated coffee in batch tank (17). For example, the following methods can be adopted: a method using a strain gauge type of sensor or a level gauge, a method in which the air pressure from the pressure of the beverage is detected, etc. Although the automatic vending machine of the aforementioned example has a hot water tank (7) for storing hot water supplied through pipe (6) from hot water tank (5), one can also adopt a system in which hot water tank (7) is not used, and hot water in hot water tank (5) is fed directly through hot water valve (12) into mixing bowl (21).

[0025]

Vending valve (32) and disposal valve (33) will be explained in the following. When the highly concentrated coffee is to be dispensed, power is turned ON for an electromagnetic coil, not shown in the figure, to open vending valve (32). When supply is to be stopped, power to the electromagnetic coil is shut OFF, and the valve is closed. On the other hand, when coffee is not

to be disposed of, disposal valve (33) is closed because power to its electromagnetic coil, not shown in the figure, is ON. When coffee is to be disposed of, the power to said electromagnetic coil is shut OFF so that the valve is opened. In this way, one can guarantee the hygienic condition of the automatic vending machine even in case of a power outage. In other words, if the power source goes OFF (power outage), it will be impossible to maintain the operation of the automatic vending machine, and the flavor of the coffee or other beverage will be lost. Also, some beverages may go bad. Although there is no problem if the duration of the power outage (power outage time) is brief, the power outage time may not be brief. Consequently, for an automatic beverage vending machine in which no preservative is added to the coffee or other beverage, it is necessary to dispose of the beverage stored in the automatic vending machine when a power outage occurs. Consequently, the disposal valve is designed to open when the power is OFF.

[0026]

Application examples

This invention will be explained in detail in the following with reference to application examples. This invention is not limited to the application examples, however.

Application examples

Mocha blend coffee beans (product of the ART Co.) for automatic vending machines were used as the raw material. Usually, 150 cc of extraction water (tap water) at 80°C were used per spoonful of said coffee raw material (about 10 g), and the obtained coffee was available for sale. In addition to this coffee with the conventional concentration, the following types of coffee were also prepared in this application example: 1.5x concentrated coffee prepared using 150 cc of the extraction water (tap water) at 80°C with about 15 g of the coffee raw material; 2.0x concentrated coffee prepared using 150 cc of extraction water (tap water) at 80°C with about 20 g of said coffee raw material; 2.5x concentrated coffee prepared using 150 cc of extraction water (tap water) with about 25 g of said coffee raw material; and 3.0x concentrated coffee prepared using 150 cc of extraction water (tap water) with about 30 g of said coffee raw material. In each case, the coffee was stored at 80°C for 2 h. The taste of the coffee was evaluated immediately after preparation (0 h), after 0.5 h of storage, after 1 h of storage, and after 2 h of storage, according to the voltage output of a taste sensor (commercial name: SA401 Taste Recognition Equipment, product of Anritsu K.K.; a lipid film taste sensor highly sensitive to sour taste. The results of measurement were represented as voltage values (mV). The voltage value for coffee at the aforementioned normal concentration is 0 mV. The higher the voltage, the more significant the deterioration. The test results are listed in Table 1.

[0027]

For each of the aforementioned coffee samples, pH was measured using a pH meter (F-16, product of Horiba Seisakusho K.K.). The results are represented by the difference obtained by subtracting the pH value (P) of the coffee liquid after the prescribed storage time from the pH value (P_0) immediately after preparation (storage time of 0). The larger the value, the more significant the deterioration. The results are listed in Table 2.

[0028]

Also, a 20-member panel was asked to evaluate the taste and other quality characteristics of the coffee in organoleptic testing. The results were rated with the following three grades: (A) No change in the quality compared to freshly-prepared coffee (storage time of 0); (B) a little deterioration in quality; (C) significant deterioration in quality. The numbers of panelists giving each grade are listed in Table 3.

[0029]

Table 1

コーヒー濃度①	⑦貯蔵時間 0時間	0.5時間	1時間⑧	2時間⑧
②通常濃度（豆10g／湯150cc）	0	6.19	9.28	14.11
③1.5倍（豆15g／湯150cc）	0	5.13	8.30	13.22
④2.0倍（豆20g／湯150cc）	0	4.20	7.41	12.39
⑤2.5倍（豆25g／湯150cc）	0	4.47	7.75	12.50
⑥3.0倍（豆30g／湯150cc）	0	5.20	8.29	12.71

Key:
1 Concentration of coffee
2 Normal concentration (10 g of coffee beans/150 cc of hot water)
3 1.5x concentration (15 g of coffee beans/150 cc of hot water)
4 2.0x concentration (20 g of coffee beans/150 cc of hot water)
5 2.5x concentration (25 g of coffee beans/150 cc of hot water)
6 3.0x concentration (30 g of coffee beans/150 cc of hot water)
7 Storage time
8 h

[0030]

Table 2

① コーヒー濃度	⑦ 貯蔵時間			
	0時間⑧	0.5時間⑧	1時間⑧	2時間⑧
② 通常濃度（豆10g／湯150cc）	0	0.12	0.22	0.34
③ 1.5倍（豆15g／湯150cc）	0	0.08	0.17	0.31
④ 2.0倍（豆20g／湯150cc）	0	0.08	0.15	0.29
⑤ 2.5倍（豆25g／湯150cc）	0	0.08	0.18	0.30
⑥ 3.0倍（豆30g／湯150cc）	0	0.10	0.18	0.29

Key: 1 Concentration of coffee
2 Normal concentration (10 g of coffee beans/150 cc of hot water)
3 1.5x concentration (15 g of coffee beans/150 cc of hot water)
4 2.0x concentration (20 g of coffee beans/150 cc of hot water)
5 2.5x concentration (25 g of coffee beans/150 cc of hot water)
6 3.0x concentration (30 g of coffee beans/150 cc of hot water)
7 Storage time
8 h

[0031]

Table 3

① コーヒー濃度	⑦ 貯蔵時間								
	0.5時間⑧			1時間⑧			2時間⑧		
	A	B	C	A	B	C	A	B	C
② 通常濃度	2人	13人	5人	0人	7人	13人	0人	1人	19人
1.5倍③	12人	6人	2人	2人	10人	8人	0人	4人	16人
2.0倍④	13人	7人	0人	2人	14人	4人	0人	8人	12人
2.5倍⑤	11人	8人	1人	1人	14人	5人	0人	9人	11人
3.0倍⑥	11人	8人	1人	1人	13人	8人	0人	8人	12人

⑨

Key: 1 Concentration of coffee
2 Normal concentration (10 g of coffee beans/150 cc of hot water)
3 1.5x concentration (15 g of coffee beans/150 cc of hot water)
4 2.0x concentration (20 g of coffee beans/150 cc of hot water)
5 2.5x concentration (25 g of coffee beans/150 cc of hot water)
6 3.0x concentration (30 g of coffee beans/150 cc of hot water)
7 Storage time
8 h

9 panelist(s)

[0032]

It can be seen from Table 1-3 that when coffee is stored at a high temperature, concentrated coffee (1.5-3x the normal-concentration coffee) deteriorates less than does coffee of normal concentration, and the effect is best for 2x concentrated coffee.

[0033]

Effects of the invention

In the automatic beverage vending machine of this invention, beverages are stored at a higher concentration. Consequently, there is little deterioration in the taste, aroma, and other quality characteristics. When the highly concentrated beverage is diluted with hot water, coffee can be provided at 80°C or higher. The highly concentrated beverage extracted from the beverage raw material with hot water is sent to and stored in a tank, and, based on determined vending instructions, a prescribed amount of highly concentrated beverage is dispensed together with hot water stored in the hot water tank, and these are mixed to produce for sale flavorful coffee at 80°C or higher. Consequently, the time required per sale can be shortened, and consumables can be used with high efficiency. When the amount of highly concentrated beverage in the tank becomes low or zero, a signal from a sensor is sent to a controller. The controller causes fresh highly concentrated beverage to be again extracted from the beverage raw material with hot water, and the highly concentrated beverage obtained is sent to and stored in a tank. The aforementioned operation is carried out repeatedly to meet the sales demand. In the automatic beverage vending machine of this invention, several types of coffee can be extracted from different types of raw materials and sold from a single automatic vending machine.

Brief description of the figures

Figure 1 is a diagram illustrating the overall constitution of this invention.

Explanation of symbols

1 Preparation unit
2 Hot water supply unit
3 Extraction/sales unit
7 Hot water tank
17 Batch tank (tank, highly concentrated beverage storage tank)
32 Vending valve (vending means)
33 Disposal valve (disposal means)

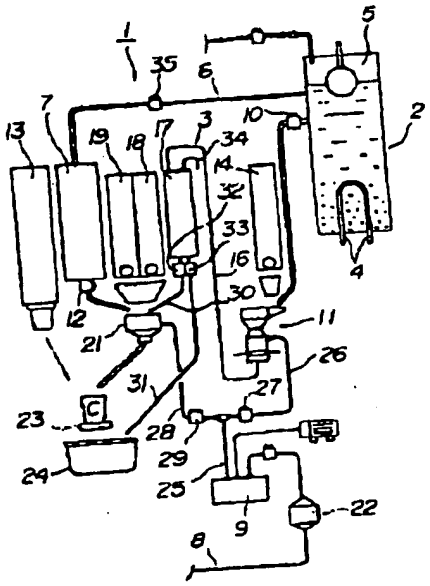

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Figure 1